



PATENT  
27622-2

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: KEITH, ET AL                      Conf.: 9045  
Appl. No.: 10/820,992                      Art Unit: 3643  
Filed: 04/08/2004                      Examiner: PARSLEY, David J.  
For: IMPROVED ACCURACY LESS LETHAL  
PROJECTILE

Declaration OF Jaime H. Cuadros

I, Jaime H. Cuadros, hereby state as follows:

1. I am one of the inventors and applicants of the above identified patent application.
2. The less-lethal projectile described in the patent application has improved accuracy over those of the prior art, due to the bore-rider stabilizer attached directly to the rear of the projectile.
3. The improved accuracy comes from the new bore-rider stabilizer, which provides two improvements to the old generic less-lethal bag projectile design.
  - a. The loss of accuracy in the vertical plane comes from the variation of exit velocity of a projectile caused by variation on the friction of the projectile and the gun barrel. The new low coefficient of friction bore rider, upon firing of the projectile, provides a lower and more consistent friction between the projectile and the gun barrel. This action produces a more uniform exit velocity from shot to shot. More uniform velocity reduces the variability of the droop of the projectile, all other variables being equal.


- b. The loss of accuracy in any other plane comes from aerodynamic forces acting unevenly on the flying projectile. The result is a larger impact area at the target for any number of shots. The new stabilizer improves the accuracy by equalizing the aerodynamic forces and transmitting the corrections necessary to the body of the projectile through the stiff petals of the stabilizer. The projectile is mass stabilized (no spinning) but any small deviations caused by aerodynamic forces are quickly corrected, before their small effect is amplified during the flight to target.

4. The gain in accuracy was demonstrated during the development testing of this projectile. The results of these tests are summarized on Table 1 (page 226) of my paper entitled "Improvements in Aerodynamic Design for KE Less-Lethal Projectiles," presented at the 22<sup>nd</sup> Ballistic International Symposium in Vancouver, BC, Canada, 14-18 November 2005.

5. The table shows the improvement in accuracy from a standard less-lethal bag projectile (ALS Power Punch) from impacting inside of a circle of 5 inches in diameter, to the new design QT-4 projectile impacting inside a 2.1-inch circle, all other variables being the same.

6. This accuracy comes at the cost of more parts and more time required to assemble the projectile. The sale price is about \$2.50 higher for the QT-4 projectile. However, the users are willing to pay the cost difference to get the improved accuracy, as shown in the attached copies of invoices showing the sale price difference.

Dated: October 16, 2006

  
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Jaime H. Cuadros

# MK BALLISTIC SYSTEMS

P.O.BOX 1097, HOLLISTER, CA 95024 PH. (800) 345-1504 FAX. (831) 636-8657

INV. #

37216

## PACKING LIST

**TOTAL DUE**

**\$0.00**

Salesperson MK  
FEIN 77-0273619  
Invoice date 8/9/2006  
Customer ID SID HEAL LASO  
Terms  
Date shipped August 15, 2006  
Shipped via UPS GROUND  
FOB  
Prepaid / Collect  
Tax exempt  
Reason  
Exemption no.

\*\*\*  
**SOLD TO**

Name  
Attn:  
Address (line 2)  
City, State or Prov.  
Postal code, count  
Phone  
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Company name

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**SHIPPED TO**

Retype the following only if the name and address are not the same as the SOLD TO name and address.

Name ARL PENN STATE  
Attn: P. KAUFMAN  
RESEARCH BLDG  
WEST / N. ATHERTON  
Address (line 2) ST  
City, State or Prov. STATE COLLEGE, PA  
Zip code, Country 16801  
Company name

Please make checks payable to:

MK BALLISTIC SYSTEMS  
P.O. BOX 1097  
HOLLISTER, CA 95024

REF NO.	QTY	DESCRIPTION	PRICE EACH	TOTAL
	10	FLEXIBLE BATON-12 CLOSE RANGE P/N 4000		
	10	FLEXIBLE BATON STANDARD P/N 4020		
	10	FLEXIBLE BATON STD- DYE MARKING P/N 4030		
	10	AERO-SOCK P/N 4023		
	10	AERO-DRAG STABILIZED TRAINING P/N 4025		
	10	QT-4 AERO SOCK P/N 4024		
	10	QT-4 AERO SOCK LEAD FREE P/N 4026		
	10	RB-2 RUBBER BATON P/N 4700		
	10	RB-2 -LV P/N 4710		
	10	RB-12 RUBBER PELLET P/N 4800		

**THANKYOU FOR YOUR ORDER**

**SUBTOTAL**

**EXCISE TAX 11.00%**

**SHIPPING & HANDLING**

**PAYMENT**

**PLEASE PAY THIS AMOUNT**

INTEREST OF 1.5% PER MONTH IS DUE IF PAYMENT IS MADE AFTER THE DUE DATE.



# MK BALLISTIC SYSTEMS

P.O.BOX 1097, HOLLISTER, CA 95023 PH. (800) 345-1504 FAX. (831) 636-8657

INV. #

37062

INVOICE

**TOTAL DUE \$2,100.00**

Salesperson MK  
FEIN 77-0273619  
Invoice date 1/5/2006  
Customer ID P.O.# N00164-06-P-0093  
Terms 30 DAYS  
Date shipped January 05, 2006  
Shipped via UPS GROUND  
FOB  
Prepaid / Collect  
Tax exempt  
Reason  
Exemption no.

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**SOLD TO**

Name NAVAL SURFACE  
WARFARE CTR. CRANE  
DIV  
K. BEANSLEY BLDG.  
Address (line 1) 2521  
Address (line 2) 300 HIGHWAY 361  
City, State or Prov. CRANE, IN  
Postal code, count 47522-5001  
Phone 812-854-3575  
Fax  
Company name CODE N00164

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**SHIPPED TO**

Retype the following only if the name and address are not the same as the SOLD TO name and address.

Name NAVAL SURFACE  
WARFARE CENTER  
Address (line 1) CRANE DIV  
BLDG 2035ES CODE  
Address (line 2) 6042  
City, State or Prov. CRANE, IN  
Zip code, Country 47522  
Company name ATTN: DENNIS JONES

Please make checks payable to:

MK BALLISTIC SYSTEMS  
P.O. BOX 1097  
HOLLISTER, CA 95024

REF NO:	QTY	DESCRIPTION	PRICE EACH	TOTAL
0001	200	#4026 NON-LEAD/ NON-LETHAL AERO SOCK BEAN BAG, 300 FPS RDS	5.25	1,050.00
0002	200	#4027 NON-LEAD/ NON-LETHAL AERO SOCK BEAN BAG, 350 FPS RDS	5.25	1,050.00
ORDER COMPLETE				

**THANK YOU FOR YOUR ORDER**

<b>SUBTOTAL</b>	\$2,100.00
<b>EXCISE TAX</b>	11.00%
<b>SHIPPING &amp; HANDLING</b>	N/C
<b>PAYMENT</b>	
<b>PLEASE PAY THIS AMOUNT</b>	\$2,100.00

INTEREST OF 1.5% PER MONTH IS DUE IF PAYMENT IS MADE AFTER THE DUE DATE.